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MCB CAMP LEJUENE
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U S EPA REGION IV COMMENTS ON THE DRAFT PROPOSED REMEDIAL ACTION PLAN
SITE UNEXPLODED ORDNANCE 19 (UXO-19) OPERABLE UNIT 25 (OU 25) MCB CAMP
LEJEUNE NC
12/10/2014
U S EPA REGION IV



Proposed Remedial Action Plan

Site UXO-19: Operable Unit 25

Marine Corps Installations East-Marine Corps Base

Camp Lejeune, North Carolina

October 2014

1. Introduction

This **Proposed Remedial Action Plan (PRAP)** identifies the Preferred Alternative for addressing potential **munitions and explosives of concern (MEC)** and/or **material potentially presenting an explosive hazard (MPPEH)** in the subsurface at Site UXO 19: **Operable Unit (OU) 25**, located at Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) in Onslow County, North Carolina. Site UXO-19 was investigated under the **Military Munitions Response Program (MMRP)** at MCIEAST-MCB CAMLEJ.

The Preferred Alternative for Site UXO-19 is **land use controls (LUCs)**. This PRAP is issued jointly by the U.S. Department of the Navy (Navy), the **lead agency** for site activities, MCIEAST-MCB CAMLEJ, and the **U.S. Environmental Protection Agency (EPA)**, in consultation with the **North Carolina Department of Environment and Natural Resources (NCDENR)**, in order to solicit public comments on the remedial alternatives and, in particular, the preferred **remedial action** for Site UXO-19. This PRAP fulfills the public participation responsibilities required under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)** and Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

This PRAP summarizes the remedial alternatives evaluated for Site UXO-19. Detailed background information for Site UXO-19 is contained in the **remedial investigation (RI)/feasibility study (FS)**, and other documents in the **Administrative Record** file and **Information Repository** for MCIEAST-MCB CAMLEJ. Key information from the RI/FS report, including the remedial alternatives considered and the rationale for selection of LUCs as the Preferred Alternative for Site UXO-19, is summarized in this PRAP.

The Navy, MCIEAST-MCB CAMLEJ, and EPA, in concurrence with NCDENR, will make the final decision on the remedial action for Site UXO-19 after reviewing and considering all information submitted during the 30-day **public comment period**. The Navy and MCIEAST-MCB CAMLEJ, along with EPA, may modify the Preferred Alternative based on new information or public comment. A **Record of Decision (ROD)** will then be prepared to document the Selected Remedy for Site UXO-19. Therefore, public comment on the Preferred Alternative is invited and encouraged. Information on how to participate in the decision making process is presented in the sidebar in Section 10.



The terms shown in **bold** are explained in the **Glossary**, beginning on page 15.

Mark Your Calendar for the Public Comment Period

Public Comment Period

TBD

Submit Written Comments

The Navy will accept written comments on the PRAP during the public comment period. To submit comments or obtain further information, please refer to the insert page.

Attend the Public Meeting

TBD

Coastal Carolina Community College
Business Technology Building, **TBD**
444 Western Blvd
Jacksonville, NC 28546

The Navy will hold a public meeting to explain this PRAP. Spoken and written comments will be accepted at the meeting.

Administrative Record File:

Available online at:

<http://go.usa.gov/Dy5T>

Internet access is available at the:
Onslow County Library
58 Doris Avenue East
Jacksonville, NC 28540
(910) 455-7350

Summary of Comments on Proposed Remedial Action Plan Site UXO-19: Operable Unit 25

Page: 1

Number: 1 Author: GTOWNSEN Subject: Sticky Note Date: 12/10/2014 4:21:58 PM

Please use the term Proposed Plan because that is what the NCP and EPA guidance require. Also, the FFA instructs the Navy to follow EPA guidance.

The MMRP Investigation Process

- Site Preparation/Surface Clearance – Involves visually inspecting the ground surface for MEC/MPPEH and removing it prior to field investigations. Can include clearing vegetation, removing obstructions, demolishing structures, and surveying transects (equally spaced lines) for a digital geophysical mapping (DGM) survey.
- DGM Survey – Uses magnetometers to locate and create a digital map of geophysical anomalies—areas of higher magnetic response that may indicate buried metal objects—that might be munitions. The instruments can be towed by hand or behind a vehicle, or mounted onto aircraft. The resulting data are used to select areas for further evaluation.
- Intrusive Investigation – Involves digging on some or all of the geophysical anomalies identified by DGM to determine whether they are created by MEC/MPPEH or fall into one of the following:
 - Non-munitions-related debris – Any metallic debris that isn't MEC/MPPEH, such as scrap metal or construction debris
 - Facility resources – Permanent structures such as utilities or culverts
 - Shared anomalies – Locations where a single item was represented by multiple anomalies
 - No contact – The anomaly location was investigated but no items were found
 - Quality control (QC) seed – Items that were intentionally buried by investigation personnel, which are the same size and shape as MEC/MPPEH likely to be found at the site, to test the quality of the DGM and anomaly retrieval process. All QC seeds were uncovered and removed during the Site UXO-19 MMRP investigation.
- Environmental Sampling and Analysis – Taking samples of soil, sediment, surface water, and/or groundwater and analyzing them in a laboratory to detect chemicals and metals associated with munitions.

2.2 Summary of Previous Investigations, Studies, and Removal Actions

Site UXO-19 was characterized through two investigations between 2009 and 2013.

Preliminary Assessment (PA)/Site Inspection (SI) (CH2M HILL, 2010)

In 2009, a PA/SI was conducted at Site UXO-19 to evaluate the nature and extent of contamination to site media that may have resulted from former range activities. Soil and groundwater samples were collected and analyzed for munitions constituents: explosives residues, perchlorate, and select metals (antimony, arsenic, copper, lead, and zinc). The locations of soil and groundwater samples are shown on Figure 2.

An MMRP investigation was conducted over a limited area of the site as described in the “MMRP Investigation Process” sidebar. MEC/MPPEH items were encountered within and adjacent to the range areas. The majority of the items were 60-millimeter (mm), and 81-mm mortar projectiles.

Human health and ecological risk screenings indicated that there were no unacceptable risks to human or ecological receptors from exposure to munitions constituents in soil or groundwater based on current or potential future use. However, there were unacceptable risks to human receptors from explosive hazards. Because of the number and types of MEC/MPPEH that were discovered, a 100 percent MMRP investigation was recommended to reduce the overall risk. No additional soil or groundwater sampling was recommended.

RI/FS (CH2M HILL, 2014)

In 2013, an RI/FS was completed to summarize the nature and extent of munitions-related contamination, evaluate potential explosive hazards, and to develop and evaluate remedial alternatives to address the remaining potential explosive hazards. An MMRP investigation was completed over 100 percent of accessible areas, including the area previously investigated during the PA/SI. MEC/MPPEH was encountered from ground surface to as deep as 4 feet (ft) below the ground surface (bgs). The distribution of MEC/MPPEH items is shown on Figures 3 and 4, and summarized in Table 1. The nature and extent of MEC/MPPEH is detailed in Section 3.1. Upon inspection and re-inspection, all demilitarized MPPEH was certified MDAS.

Potential explosive hazards were significantly reduced. However, there are limitations to MMRP investigations including those imposed by instrument limits and site conditions. Although some MEC/MPPEH items were detected at greater depths, instruments used during MMRP investigations can reliably detect the smallest items suspected to be present onsite to a depth of only 2 ft bgs. Limiting site conditions include standing water, buildings, utilities, compacted roadways, and other structures that prevented access. Therefore, MEC/MPPEH may remain onsite in those areas where it could not be detected due to the above limitations.

The FS evaluated the following remedial alternatives:

- 1 – No Action
- 2 – LUCs
- 3 – Subsurface removal of MEC/MPPEH in undeveloped areas (via excavation, DGM, and intrusive investigation) and LUCs
- 4 – Subsurface removal of MEC/MPPEH in undeveloped areas (via excavation and sifting) and LUCs

Number: 1 Author: GTOWNSEN Subject: Sticky Note Date: 12/10/2014 9:22:09 AM

This sentence defines limiting site conditions, although it is not exactly mentioned in earlier statements. The second sentence of this paragraph infers that there are site limitations, however, it has to be an interpretation to understand the thought. I would suggest rewording this sentence to read: "Site conditions that could limit MMRP investigations include ..", or remove the word "limiting" and begin the sentence with "Site".

Number: 2 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:33:18 AM

Need to provide more detail on this effort including a map or figure depicting the extent of the survey and even transects. The total amount of items should be provided and state how they were managed (blown-up on-site or taken for treatment elsewhere and disposed)
This info is included in the PA/SI.

Figure 4 – Anomaly Investigation Results

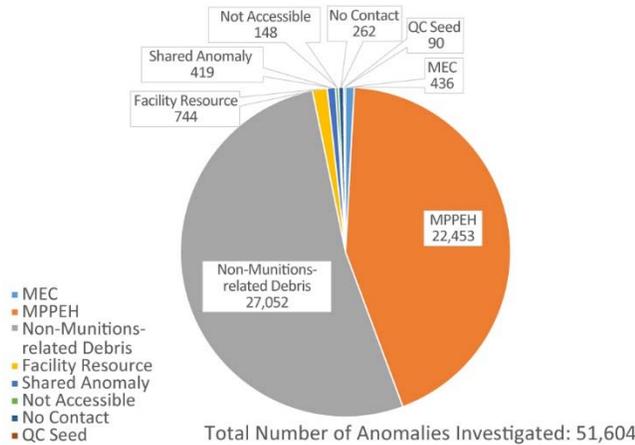


Table 1 – Type and Quantities of MEC/MPPEH

Item Type	Number of Items*	
	MEC	MPPEH
Flares	140	1,212
Fuzes and Igniters	5	233
Grenades	59	1,260
Mines	7	83
Mortar Projectiles	226	38,075
Bulk Explosives	3	0
Projectiles	2	47
Rockets	5	0
Small Arms Ammunition	Not applicable	9,861
Total	447	50,771

* Multiple items were found at some individual anomaly locations.

3. Site Characteristics

The topography within the site boundary is relatively flat, with surface elevations ranging from 14 to 26 ft above **mean sea level (msl)** across the site. No surface water bodies lie within the site, although stormwater runoff is anticipated to flow toward the east and southeast, eventually discharging to unnamed tributaries of the New River.

Buildings within the site consist of small concrete block classrooms, military housing, a small medical facility, a bath house, and a headquarters building. An obstacle training course is also located on site.

The eastern portion of the site is generally undeveloped. Before investigation activities began, approximately 90 percent of the site was heavily vegetated. Much of the vegetation, including trees

smaller than 6 inches in diameter, was cleared during the RI.

The shallow soils encountered within the site consist of poorly graded sands, sands with variable amounts of silt and clay, and occasional clay lenses ranging from 3 inches to more than 9 ft thick.

Groundwater elevations range from 4.62 to 10.40 ft above msl. Groundwater in the surficial **aquifer** generally flows toward the northeast with an average hydraulic conductivity of 0.002 ft/ft.

The **conceptual site model (CSM)**, Figure 5, presents a summary of the MEC-related hazard sources, exposure pathways, and environmental receptors.

3.1 Nature and Extent of Contamination

Munitions Constituents

Surface and subsurface soil and groundwater were investigated during the PA/SI. The following constituents were detected above screening levels:

- Surface Soil – Antimony, arsenic, and nitroglycerin exceeded screening levels at one or more locations.
- Subsurface Soil – Arsenic exceeded screening levels at one or more locations.
- Groundwater – 3-nitrotoluene exceeded the screening level at one location.

MEC/MPPEH

The DGM survey identified 51,604 anomalies that represented potential MEC/MPPEH (Figure 4). Of these, the sources of 436 anomalies were found to be MEC and the sources of 22,453 were found to be MPPEH. MEC/MPPEH items were widespread across the investigation area and were found on the ground surface and at depths of up to 4 ft bgs (Figure 3). A total of 447 MEC items were uncovered, over half were mortar projectiles, with several possibly containing explosives, white phosphorus, **illuminating, smoke**, and hexachlorethane filler. Flares and grenades made up the majority of the remaining MEC items. The distribution of MPPEH items was similar to MEC, mortar projectiles were the most common item, followed by grenades and flares. Several pieces of small arms ammunitions (bullets) also uncovered during the MMRP investigation.

As a result of limitations discussed in Section 2.2, MEC/MPPEH potentially remains in the uninvestigated areas and at depths greater than 2 ft bgs.

Page: 6

 Number: 1 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 9:50:08 AM

Please include statement that includes reference for the screening levels such as the origin EPA RSLs or other Agency guidance and the concentration.

 Number: 2 Author: GTOWNSEN Subject: Sticky Note Date: 12/10/2014 11:06:24 AM

Should this be "illuminating smoke" without a comma?

 Number: 3 Author: GTOWNSEN Subject: Highlight Date: 12/10/2014 11:05:18 AM

 Number: 4 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 9:51:26 AM

Should add a statement that states the munitions were recovered and destroyed. As it reads, the paragraph is only describing what was found (uncovered), it does not give the final disposition of the materials. Please describe how these removed items were treated/disposed.

3.2 Fate and Transport of Contamination

Munitions Constituents

Metals and explosives residues have the potential to be released into the environment if the casing on MEC/MPPEH corrodes, exposing the filler, or if filler is exposed as a result of incomplete detonation. Upon release, fate and transport of the explosives residues and metals are controlled by physical processes such as sorption, dilution, advection, and dispersion; and by chemical and biological processes such as biodegradation, phototransformation (transformation processes requiring natural light), and phytotransformation (uptake and possible degradation through plants).

MEC/MPPEH

Migration of MEC/MPPEH, other than through human transport, is considered unlikely based on regional conditions influencing natural mechanisms and because possible MEC/MPPEH remaining onsite is either beneath structures or buried deeper than 2 ft. Frost upheaval in the Coastal Plain region of North Carolina is considered unlikely because the average temperature in the coldest months is 45° F and the average daily minimum temperature is 32° F. Drought, flooding, erosion, and tidal changes are also not likely to affect this area.

Based on the historical activities conducted and the types of ordnance used at the site, MEC/MPPEH is unlikely to be deeper than 4 ft below the original ground surface due to penetration; however, site activities (construction, filling of low areas, resulting erosion, etc.) may disturb MEC/MPPEH potentially below the surface and/or cause MEC/MPPEH to become buried to deeper depths below current grade.

3.3 Principal Threats

Principal threat wastes are source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should they be exposed. Buried MEC/MPPEH in the soil may be considered a principal threat because it poses a potential explosive hazard to human receptors. However, the quantity and distribution of MEC/MPPEH most likely to be encountered (from the surface to 2 ft bgs) was significantly reduced during the MMRP intrusive investigation and the site is located on a restricted military base. If MEC/MPPEH were encountered, the likely receptors would be military personnel and other workers

who have been trained in UXO avoidance. Furthermore, in order to result in an explosion, many of the items would need aggressive contact. Therefore, the potential for exposure that could result in an explosion is low.

4. Scope and Role of Response Action

MCIEAST-MCB CAMLEJ was placed on EPA's **National Priorities List (NPL)** effective November 4, 1989 (54 *Federal Register* 41015, October 4, 1989) under the narrative "Camp Lejeune Military Reservation (USNAVY)" and EPA ID# NC6170022580. There are 25 discrete OUs under CERCLA investigation at MCIEAST-MCB CAMLEJ. OU 25 is in the MMRP and consists of Site UXO-19.

Information on the status of all the OUs and sites at MCIEAST-MCB CAMLEJ can be found in the current version of the site management plan, available in the Administrative Record.

5. Summary of Site Risks

Potential human health and ecological risks from exposure to site media were evaluated in the PA/SI and RI/FS. The following subsections summarize the risk assessment results.

5.1 Human Health Risk Screening – Munitions Constituents

The **human health risk screening (HHRS)** evaluated the potential risks to human health from exposure to munitions constituents in surface soil, subsurface soil, and groundwater.

Potential exposure pathways evaluated included the following:

- Contact with explosives residues and metals in surface soil (military personnel, maintenance workers, and trespassers)
- Contact with explosives residues and metals in subsurface soil (future residents and future construction workers)
- Contact with surficial groundwater during construction or excavation activities (future construction workers)
- Contact with surficial groundwater used as a potable water supply (future industrial workers and future residents)

Health risks are based on a conservative estimate of the potential **cancer risk** or the potential to cause other health effects not related to cancer [noncancer hazard, or **hazard index (HI)**]. EPA identifies an

Number: 1 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 9:58:05 AM

This is an undefined activity and should be clarified with examples of such that could include digging with a shovel or intrusive activity.

Number: 2 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 9:52:40 AM

This is too strong of a statement and facts at the site suggest constituents are not always "controlled". Revise to state "may be controlled in some instances by physical..."

Number: 3 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:46:03 AM

This statement is not supported with any data or references. Stormwater for example can result in erosion that exposes items as noted in next paragraph. Revise or remove this statement accordingly.

Number: 4 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 9:57:20 AM

Revise as follows: "Although the term PTW is generally associated with, for example, contaminated soil, buried waste, NAPL and other toxic wastes, buried MEC..."

acceptable cancer risk range of 1 in 10,000 (10^{-4}) to 1 in 1,000,000 (10^{-6}) and below and an acceptable noncancer hazard as an HI that does not exceed 1. The estimates of risk at Site UXO-19 were used to determine if any further actions were required to sufficiently protect human health. The HHRA concluded that there is no unacceptable risk from exposure to surface soil, subsurface soil, and surficial groundwater at Site UXO-19.

5.2 Ecological Risk Screening – Munitions Constituents

The **ecological risk screening (ERS)** evaluated potential risks from munitions constituents in soil and groundwater to ecological receptors. The ERS was completed by calculating a **hazard quotient (HQ)** by dividing the maximum concentration by **ecological screening values (ESV)**. Additional lines of evidence in the ERS included **background threshold values** for metals, frequency of detection, magnitude of exceedance, relationship between screening value and average exposure concentration, and whether a constituent is a known laboratory contaminant.

The ERS concluded that there were no unacceptable risks to ecological receptors from exposure to surface and subsurface soil and groundwater. In addition, based on the frequency of detection and levels detected in onsite samples, risk is considered acceptable in drainage ditches that receive runoff or discharged groundwater from the site.

5.3 Explosive Hazard Evaluation – MEC/MPPEH

The explosive hazard evaluation considered site factors, human factors, and ordnance factors in the assessment of potential explosive threats posed to human receptors by the potential presence of MEC/MPPEH in the surface and subsurface soil within the boundary of Site UXO-19.

- **Site Factors** - Site access is generally restricted to military or other authorized personnel who have been trained to recognize potential explosive hazards. There are no physical barriers to the site, but natural features and the presence of military personnel limit the likelihood that trespassers would enter the site.
- **Human Factors** – Approximately 21,000 Marines are trained at Camp Devil Dog annually. Troops live in barracks and spend most of their time onsite resulting in a high amount of potential contact

time. Training may include intrusive activities, resulting in contact with buried MEC/MPPEH. All military and civilian personnel who access the site are required to complete munitions safety training.

- **Ordnance Factors** –The majority of MEC/MPPEH items found were mortar projectiles and flares with a variety of filler types including high explosives, white phosphorus, illuminating, smoke, and hexachlorethane filler. If MEC/MPPEH of the types previously discovered are onsite and did not function as designed, the probability of an unintentional detonation by casual contact, such as accidentally stepping on it, is moderate to high. More aggressive contact, such as striking the MEC/MPPEH, would make the probability of detonation even higher.

The potential for human contact with MEC/MPPEH was significantly reduced by the MMRP investigation completed during the RI. However, MEC/MPPEH may be encountered at depths greater than 2 ft, and in areas within the site that could not be investigated (such as beneath existing structures).

What is an Explosive Hazard Evaluation?

- An explosive hazard evaluation is a qualitative assessment of the likelihood of an explosion resulting in human injury or casualty to occur.
- For the presence of MEC/MPPEH to result in a human injury or casualty, MEC/MPPEH must be present, a human receptor must come into contact with, or be in the vicinity of, the MEC/MPPEH, and an event to cause the functioning of the MEC/MPPEH must take place.
- In order to assess the likelihood of an explosive injury occurring, three types of factors are evaluated:
 - **Site Factors** – These factors address site-specific features that impact the likelihood that a human receptor may come into contact with MEC/MPPEH, or be within close enough proximity of MEC/MPPEH to be injured during an explosive event. Site factors include physical features related to accessibility of the site.
 - **Human Factors** – These factors address the likelihood that a human receptor would come into contact with or be in close proximity to MEC/MPPEH. Human factors include the number of people accessing the site, the frequency and duration of access, and the activities conducted while onsite.
 - **Ordnance Factors** – These factors address whether an explosive event is likely to occur if contact is made with MEC/MPPEH and the severity of the explosive event if one did occur. Ordnance factors include size, type, sensitivity, location, density, and depth.

6. Remedial Action Objectives

The role of the Preferred Alternative presented in this PRAP is to address the explosive hazards present at Site UXO-19 by preventing current and future human exposure to potential explosive hazards posed by MEC. It is the judgment of the Navy, MCIEAST-MCB CAMLEJ, and EPA, in concurrence with NCDENR, that the Preferred Alternative identified in this PRAP is

Number: 1 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 9:59:13 AM

Need to elaborate that contaminant levels in soil and groundwater were found to be within acceptable risk range or for GW did not exceed MCLs or other health based drinking water levels

Number: 2 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:09:43 AM

Use the DoD ranking system of 1-4 that indicates threat or hazard level due to MEC/MPPEH. Indicate the ranking of this site and what the ranking scale means for context to readers unfamiliar with the process. Note: this info is included in the RI/FS and can be added as a brief summary to the text. Suggestion would be to include the ranking/discussion before and after removal. (pg. 6-8 of RI/FS)

necessary to protect public health and welfare from potential explosive hazards.

In order to be protective of human health and the environment and to address potential hazards identified in the explosive hazard evaluation, the **Remedial Action Objectives (RAOs)** identified for Site UXO-19 are as follows:

- 1 Prevent human exposure to explosive hazards.
- 2C Reduce explosive hazards associated with current and future land use (infantry training).

7. Summary of Remedial Alternatives

The remedial alternatives that were developed and evaluated to address MEC on the surface and in the subsurface within the developed/inaccessible areas and MEC in the subsurface within the undeveloped area at Site UXO-19 are detailed in the FS. A summary of remedial alternatives is presented in Table 2.

With the exception of the No Action alternative, all alternatives comply with ARARs and have the same RAOs and anticipated future land uses. The No Action alternative does not protect human health and the environment, but is presented as a baseline for comparison purposes.

8. Evaluation of Alternatives

The NCP outlines the approach for comparing remedial alternatives using the **nine evaluation criteria** listed in the following subsections (see the Glossary for a detailed description of each). Each remedial alternative for Site UXO-19 was evaluated against the criteria. A summary of the comparative analysis of the alternatives is presented in the following subsections and in Table 3.

8.1 Threshold Criteria

Overall Protection of Human Health and the Environment

All of the alternatives screened, with the exception of the No Action alternative, are protective of human health and the environment by reducing or controlling risks posed by the site through remedial strategies and/or LUCs. Alternatives 2, 3, and 4 are protective of human health and the environment because LUCs would control exposure to the subsurface MEC. The intrusive investigation conducted to-date has reduced the potential explosive hazard by reducing the amount of MEC onsite. Although Alternatives 3 and 4 would

involve actions to further reduce the potential to encounter MEC within the undeveloped area, complete removal of MEC cannot be guaranteed. MEC may also remain in the developed/inaccessible areas. Therefore, a low to moderate risk of explosive hazard would still be present after the MEC removal actions described in Alternatives 3 and 4 were implemented and LUCs would still be needed to prevent exposure.

Compliance with ARARs

Section 121(d) of CERCLA, as amended, specifies in part, that remedial actions for cleanup of hazardous substances must comply with the ARARs unless they are waived under CERCLA Section 121(d) (4). See also 40 Code of Federal Regulations (CFR) § 300.430(f)(1)(ii)(B).

Alternatives 2, 3, and 4 are expected to comply with ARARs and it is not anticipated that any waivers will be required for these alternatives. A Notice of Contaminated Site will be filed as part of Alternatives 2, 3, and 4. Additional action-specific ARARs apply to Alternatives 3 and 4 based on earth-moving activities and the potential for MEC/MPPEH to be encountered, requiring management and disposal.

8.2 Primary Balancing Criteria

Long-term Effectiveness and Permanence

Each alternative, ~~except the No Action alternative,~~ provides some degree of long-term protection that increases if MEC removal is included. Alternatives 3 and 4 may appear to be more effective in the long term because they would involve permanent removal of MEC up to a depth of 6 ft bgs throughout the undeveloped areas of the site. However, the resulting improvement of long-term effectiveness and permanence is marginal when compared to Alternative 2. Although removal of subsurface MEC minimizes the potential for exposure over time, the ability to remove the subsurface MEC is subject to the technology available to detect them and complete removal cannot be guaranteed. Additionally, the possibility for trespassers to encounter MEC is limited because MEC most likely to have been encountered (from the surface to 2 ft bgs) were removed, to the maximum extent practicable, during previous investigation activities. Therefore, the actual level of long-term protection for Alternatives 2, 3, and 4 would be relatively similar and LUCs would be required to minimize uncontrolled exposure to MEC that potentially remain.

Number: 1 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:10:26 AM
add "posed by MEC/MPPEH remaining in surface and subsurface soils."

Number: 2 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:15:54 AM
This cannot be done without treatment or some other physical interaction with the MEC/MPPEH items. Suggest that this RAO be revised to better reflect what is intended. The two RAOs can be combined. See example below.

*Example from Milan's Proposed Plan:
Reduce or prevent the potential for
direct physical contact of receptors with MEC at the surface and within the subsurface to allow current land use of
the site to continue.*

Number: 3 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:16:57 AM
Should this be MEC/MPPEH? Note that the term MEC is used throughout this page and thus there may need to be multiple revisions.

Number: 4 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:17:30 AM
add: therefore, it does not meet the threshold criteria and will not be evaluated further.

Number: 5 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:18:46 AM
remove: "except the No Action alternative"

Number: 6 Author: GTOWNSEN Subject: Cross-Out Date: 12/10/2014 4:11:35 PM

Table 3 – Comparative Analysis of Alternatives

CERCLA Criteria	Alternative			
	(1)	(2)	(3)	(4)
Threshold Criteria				
Protection of human health and the environment	○	●	●	●
Compliance with ARARs	○	●	●	●
Primary Balancing Criteria				
Long-term effectiveness and permanence	2	●	●	●
Reduction in toxicity, mobility, or volume through treatment	3	○	●	●
Short-term effectiveness	4	●	●	○
Implementability	5	●	●	○
Present worth cost	6	\$570K	\$2.8M	\$7.6M

Notes:

- Alternative 1: No Action
- Alternative 2: LUCs
- Alternative 3: Subsurface Removal of MEC/MPPEH in Undeveloped Areas (via excavation, DGM, and intrusive investigation) and LUCs
- Alternative 4: Subsurface Removal of MEC/MPPEH in Undeveloped Areas (via excavation and sifting) and LUCs

Ranking: ● High ● Moderate ○ Low

Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria.

Reviews conducted at least every 5 years, as required by CERCLA, would be necessary to evaluate the effectiveness of any of the alternatives because hazards would remain onsite above levels that allow for unlimited use and unrestricted exposure.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 3 and 4 achieve reduction of toxicity, mobility, or volume through treatment because they include the removal and treatment (detonation) of subsurface MEC within the undeveloped areas of the site. There would be no reduction in toxicity, mobility, or volume through implementation of Alternative 2 because no treatment technologies would be employed.

Short-term Effectiveness

Short-term effectiveness, in terms of risks to workers, the community, and environment during implementation, would be lowest for Alternative 2 as no activities other than administration of LUCs would be conducted. Alternative 2 also has the lowest potential impact to the environment during implementation since no active treatment would be performed, only LUCs.

Risks to workers and the environment are higher for the active treatment Alternatives 3 and 4, but would be minimized through the use of engineering controls to prevent damage to human health and the environment. Alternative 3 is more effective than Alternative 4 in the short-term based on the shorter period of time to implement the remedy (six months vs. one year). Alternative 4 would have the largest potential impact to the environment because it would require significant use of heavy equipment to implement, resulting in higher emissions released into the atmosphere than Alternative 2 and 3.

Implementability

Alternative 2 would be the easiest to implement because LUCs are primarily an administrative action with minor field work to install signs. It is technically and administratively feasible, and the services, equipment, and materials required for its implementation are readily available. Both Alternatives 3 and 4 would require extensive vegetation clearance, soil excavation, stockpiling, and intrusive removal action activities that would potentially impact military training activities during implementation. Alternative 3 would include DGM, and subsequent intrusive investigation of the undeveloped area of the site and the resources and technologies to implement these

 Number: 1 Author: GTOWNSEN Subject: Sticky Note Date: 12/11/2014 10:31:15 AM
The No Action evaluation table has changed based on the discussions. The proposal is to discontinue ranking after the threshold criteria. "No Action" does not meet the threshold criteria, therefore, the no action is not protective and will not be evaluated further.

 Number: 2 Author: GTOWNSEN Subject: Cross-Out Date: 12/11/2014 10:31:30 AM

 Number: 3 Author: GTOWNSEN Subject: Cross-Out Date: 12/11/2014 10:31:43 AM

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activities are commonly used and available. Alternative 4 involves soil sifting and would have the lowest degree of implementability because of the overall volume of soil to be sifted and the duration estimated to complete the removal action.

Cost

An order-of-magnitude cost for each alternative has been estimated based on a variety of key assumptions. Costs and remedy components that were used in the cost estimate are summarized in Table 2.

The estimated present worth costs for the alternatives, ~~not including the No Action alternative~~, range from \$570,000 for Alternative 2 to \$7.6 million for Alternative 4.

8.3 Modifying Criteria

State Acceptance

State involvement has been solicited throughout the CERCLA and remedy selection process. NCDENR supports the Preferred Alternative, and its final concurrence will be solicited following the review of all comments received during the public comment period.

Community Acceptance

Community acceptance will be evaluated after the public comment period for this PRAP.

9. Preferred Alternative

Alternative 2, LUCs, was selected as the Preferred Alternative to address the potential explosive hazards posed by MEC/MPPEH remaining at Site UXO-19.

The preferred alternative consists of the following:

- Warning signs around the perimeter of the site.
- Restricting intrusive activities within the undeveloped area to less than 2 ft bgs.
- Restricting intrusive activities in areas identified as developed/inaccessible.
- Requiring UXO construction support for all intrusive activities greater than 2 ft bgs in the undeveloped area and any intrusive activity in the developed/inaccessible area.
- Munitions safety awareness training for all personnel working within the site boundary.

The following LUCs would be implemented:

- Intrusive Activities Control (MEC) in Developed/Inaccessible Areas – Require UXO

construction support for any intrusive activities within the areas identified as developed or inaccessible within Site UXO-19. Require 3R (Recognize, Retreat, Report) munitions safety awareness training for Base personnel and subcontractors working within the Site UXO-19 boundary.

- Intrusive Activities Control (MEC) in Undeveloped Areas – Restrict intrusive activities within the undeveloped area with potential explosive safety hazards to less than 2 ft bgs. Require UXO construction support for all intrusive activities greater than 2 ft bgs and munitions safety awareness training for all personnel working within the Site UXO-19 boundary.

Additionally, a Notice of Contaminated Site would be filed in Onslow County real property records in accordance with North Carolina General Statutes 143B-279.9 and 143B-279.10.

The LUCs will be implemented and maintained by the Navy and MCIEAST-MCB CAMLEJ. The estimated LUCs are provided in Figure 6; the actual LUC boundaries will be finalized in the Remedial Design (RD). The LUC implementation actions, including enforcement requirements, will be provided in a Land Use Control Implementation Plan (LUCIP) that will be prepared as part of the RD.

The Navy will submit the LUCIP and RD to EPA and NCDENR for review and approval pursuant to the primary document review procedures stipulated in the Federal Facility Agreement. The Navy will maintain, monitor (including conducting periodic inspections), and enforce the LUCs according to the requirements contained in the LUCIP and the RD. The need for LUCs to prevent exposure to explosive hazards and ensure protection will be periodically reassessed.

Based on information currently available, the Navy, MCIEAST-MCB CAMLEJ, EPA, and NCDENR believe the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Navy expects the Preferred Alternative to satisfy the following requirements of CERCLA: (1) protects human health and the environment, (2) complies with ARARs, (3) is cost-effective, (4) uses permanent solutions and alternative treatment technologies to the maximum extent practicable, and (5) preference for treatment as a

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remove: "not including the No Action alternative"

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The EPA prefers that the navy use the LUC Checklist language in the PP but it will be required in the ROD in order for EPA to approve/sign. Reference LUC Checklist #6 and #7, see below.

_6. Duration language: "Land Use Controls will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure."

_7. Include language that the [federal agency] is responsible for implementing, maintaining, reporting on, and enforcing the land use controls. This may be modified to include another party should the site-specific circumstances warrant it.

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Revise to delete "LUCs" and replace with the phrase 'land use restrictions. And add another LUC above to revise the Base Master Plan and/or GIS mapping with the the land use restrictions for this site.